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UNITED STATES GOVERNMENT

# Memorandum

JUL 9 1965

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TO : T. C. Byerly and H. C. Knoblauch  
~~(through C. L. Lefebvre)~~

DATE: Nov. 16, 1964<sup>52</sup>//

FROM : A. J. Loustalot <sup>2</sup> *ajl*

SUBJECT: <sup>3</sup> Report of meeting on "Remote Sensors" National Academy of Sciences,  
Nov. 10, 1964 <sup>11</sup> *+*

## ATTENDANCE

R. Shay - Purdue Univ. - Chairman	H. Sprague - Executive Sec. - Agr. Board
R. Colwell - Univ. of Calif.(Berkeley)	B. Kelly - USDA-AMS
N. Langren - USDA-ERS	M. Holler - Univ. of Mich.
H. Stelle - USDA-ERS	H. Rhodenheiser - USDA-ARS
V. Meyer - USDA-Weslaco, Tex.	V. Mainzer - Univ. of Maine
D. Gates - National Bur. of Standards - Boulder, Colo.	R. Keller - USDA-Forest Service
W. McClellan - USDA-ARS	F. McDonnell - IBM
Mr. Quimby - NASA	Mr. Jenkins - NASA
	Peter Badgley - NASA
	A. J. Loustalot - USDA-CSRS

## PURPOSE OF MEETING

1. To discuss areas of mutual interest in the field of "remote sensors" between Agriculture and the Space Programs and,
2. To explore the possibility of developing joint projects in the design and use of "remote sensors" by both Agriculture and NASA in the exploration of space and earth with orbiting manned or unmanned orbital flights.

## BACKGROUND INFORMATION PROVIDED BY NASA

The National Aeronautics and Space Administration is engaged currently in the planning of scientific payloads for future earth and planetary (Mars, Venus) orbital spacecraft. These vehicles are expected to play a role in planetary exploration analogous to aerial surveys in the mineral exploration field. Sensors which are being considered include detectors to measure infrared, microwave, X-ray and gamma ray emittance, active radar systems multiband photography, gravity and magnetic sensors, and so forth. The current feasibility program and its relationship to future manned missions were discussed.

The NASA representatives provided the agricultural scientists with some idea of the National Aeronautic and Space Administration's plans for planetary exploration from orbital altitudes. The term "planetary" was used to include any body, except a comet or a meteor, that revolves about the sun of our solar system. Planetary exploration thus includes the study of the earth from space.





Their report concentrated mainly on exploration of the earth and the moon using orbital spacecraft but the experience acquired on these earlier vehicles is directly applicable to other later planetary missions (Mars, Venus, etc.) also. These vehicles are expected to play a role in planetary exploration analogous to aerial surveys for terrestrial exploration objectives.

The earliest manned flights (Project Mercury) have demonstrated the ability to put a large manned spacecraft in earth orbit and to bring the manned capsule safely back to earth. This was primarily an engineering feat. Project Gemini's principle objectives are to identify the role that man can assume in scientific exploration in space, to begin the training of inflight space scientists, and to demonstrate man's ability to live in space over periods of up to two weeks duration. The succeeding manned missions, beyond the initial Apollo landings will be the first truly scientific manned orbital flights with an integrated scientific mission objective. These missions are expected to achieve some specific objectives. In lunar orbit the NASA is studying the ways in which remote sensors can be used to aid in the geologic exploration of the moon. In earth orbit some very interesting terrestrial applications are expected in addition to astronomical, bioscience and space physics experiments. The earth oriented applications will depend very heavily on the use of the most advanced types of remote sensing devices.

Because the scientific application of remote sensors are not well demonstrated, the NASA is now engaged in a comprehensive flight program over known ground sites in an attempt to gain a better appreciation of these new and hopefully very useful tools.

The remote sensors being studied range across the entire electromagnetic spectrum and also include the study of gravity and remote geochemical devices. The feasibility studies now underway are expected to yield answers to several important questions.

Many scientists are now being exposed to orbiting spacecraft for the first time so that the difference between manned and unmanned spacecraft means very little to them. What NASA is asking the scientific community is as follows: What natural phenomena do you wish to observe? Which of these are most important? With what resolution do you wish to observe these phenomena (to the nearest centimeter? foot? 0.1 C)? Do you wish to observe these phenomena with a number of visual and electromagnetic sensors at the same time or by only one sensor at a time? How often do you wish to observe these phenomena? What weight, power and telemetry requirements will your instruments call for? How selective must you be in acquiring the data? NASA scientists will have to answer some of the questions. The use of various sensors over the same terrain or ocean will provide comparative data that will explicitly define the capabilities of each sensor.





The representatives from the USDA and the Agricultural Experiment Stations reported on the current use and problems of remote sensors in agriculture and forestry.

#### ACTION TAKEN

A proposal, setting forth objectives, application, degree of accuracy required, frequency of observation, etc. of "remote sensors" for use in agriculture and forestry will be prepared by the scientists from the USDA and Agricultural Experiment Stations and presented to NASA for possible support. The NASA representative indicated there may be funds available for this purpose in the current fiscal year.





